

## STUDYING THE ROLE OF RESEARCH AND DEVELOPMENT ON ENTREPRENEURSHIP FEATURES OF THE EMPLOYEES

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**Abstract:** Dealing with the principal case of entrepreneurship is the point strictly seems to be essential in present harsh conditions of the community. Management of entrepreneurship is considered as a management model different from traditional management processes showing that entrepreneurship values and processes can occur in any organization. In this way, research and development are as the efficient and main known tools of entrepreneurship. The aim of this study was to investigate the role of research and development in the entrepreneurial characteristics of employees. The population of the study consisted of all employees of Iran Khodro in Tehran. Path analysis method was used to review and test variables. The findings suggested that research and development had an indirect impact on entrepreneurial characteristics of the employees. Also the mediating variables of organizational learning and employee satisfaction had a significant effect on the entrepreneurial characteristics of employees in the Iran Khodro company at 0.01 level.

**Keywords:** Research and development, organizational learning, employee satisfaction, entrepreneurial characteristics.

### INTRODUCTION

The worry of politicians and economic management about the issue of employment and unemployment is an issue that has fueled the debate on entrepreneurship and makes it attractive for the researchers. This case has increasingly considered the self-employment thinking style as a solution (Peneder, 2009). Achieving high levels of excellence in organizations and economical growth of the society needs to develop and promote the entrepreneurship level in the country. In fact, training is a rapid weapon of economic development in developed countries, therefore, third world countries like Iran require entrepreneurship in order to achieve competitive advantages and resolve public problems like unemployment and so on. Training and education of skills are from the strategic actions to promote entrepreneurship development, training and entrepreneurial of capabilities.

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Entrepreneurship is not related to the human resources in organizations, as social and private entrepreneurs as well as concentrated entrepreneurs on profit, as organization managers can be a proper entrepreneurs are good for your organization if the right conditions are present. It seems that in their view, obstacles and problems of organizational efficiency has a structural aspect and therefore if problems become resolved, we can expect to have entrepreneurs organizational (Solomon, 2007). Regarding the role and importance of entrepreneurship in growth and innovation of organizations, it should be said that that unfortunately little attention are paid to entrepreneurship in the country and it is easy to understand that entrepreneurial activities become less visible and recognizable in organizations of the country. This is perhaps due to the inherent obstacles in the structure and management culture of the organizations.

Type of research and development performance and its efficiency besides the form of staff entrepreneurship are the main factors of improvement of markets and industry for growth and competition. The main issue of this study was to evaluate the actual performance of these two factors and their influence on each other in the automobile industry (Brown, 2015). Today, in the developed countries, R and D which leads to increase of productivity, reduce of costs and ultimately improve product's quality and manufacturing methods, reduce of waste, enhance of competitiveness, longitudinal and lateral expansion of businesses, production and transfer of technology, improvement of customer satisfaction and wealth creation and prosperity as more share in relation to the basic and applicable researches. In many of these countries, more than 65 percent of national research expenditure allocated to development studies (Johnsson et al, 2015). In our country in recent years despite existence of very weak fields of quantitative research projects and problems arising from lack of research funding, a series of research and development units in many units produced was formed;

As at present, more than 1000 units have R and D sections in the Ministry of Industries and Mines, but unfortunately in lots of these companies, R and D sections are not place in the context of current activities and they have a fade role on effectiveness of research activities. Conducted studies have shown that non-effectiveness of research activities of RandD units in the country were caused by bottlenecks and problems as mentioned below:

- lack of proper administrative structure.
- poor management will and lack of priority in the use and application of research and development
- import of majority of industries and lack of serious competition among the industries with domestic and foreign industries

- paying more attention to resolve problems of a technical moment (the operator), financial, legal, administrative and development activities
- lack of proper organization
- lack of understanding, trust and confidence appropriate to the activities and tasks of the research and development
- heaviness of research costs
- Weaknesses in the collection of the necessary expertise in research and development.
- Lack of attention to the market and customer needs.
- Lack of facilities and equipment needed for the research in some units.
- Lack of communication and coordination among research and development units to use the available research experiences of researchers and research facilities.
- Do not use passive times of reinvestment facility and other units to buy the same machine (Rahmani, 2008).

The interesting point is that despite the importance of this issue and lots of research and development centers of Iranian companies, little effort is made to evaluate these performances specially and with inter-sectoral approach of the industry. In this study, it is tried investigate the role of research and development in entrepreneurial characteristics of personnel of Iran Khodro Company.

## **THEORETICAL FRAMEWORK**

At the end of the Civil War in the United States, development-oriented industry reached its peak. Even before it, the superiority of North people caused by their industrial power (influencing their scientific, cultural, economic power, etc.) and their win in the war, it cleared the path after the war. It was not just the United States under rapid industrialization but also competing countries (mainly in Europe) stepped in this direction.

In the late nineteenth century, BASF German Company commissioned its laboratories in the field of paint with the task of providing the formulation and development of new technologies in the paint industry which practically was the first unit of R and D (Henry *et al.*, 2015).

In the late nineteenth century (90<sup>th</sup> decade) by development of severe competition and emergence of problems, R and D purposes of the companies was changed and moved from answering to the actual needs of the customers to the border of accompanying with the development of requirements and affecting the whole organizations and its requirements. Briefly, the characteristics and differences of these four generations can be stated as follows:

### **The First Generation**

Primary laboratories where scientists often work in isolation and their inventions were a shift. Results were mostly of the discontinuous innovations.

### **Second Generation**

R and D sections in industrial and army units and who had close contacts with laboratories. These units were faced with government pressure and intense competition. The economic arguments were not significant and were mainly the result of attention. At this time, the dynamic activity was in technical technologies related to the product.

### **The Third Generation**

The research and development unit have faced many developments in terms of functionality and content, as in addition to industrial and government research and development has important activities in the areas of commercial, political, cultural and social compiled and factory. So that in addition to responding to the company managers, it is responsible about other technical issues and other activities required to report to the authorities of the country. Scientific and practical discussion of project and economic issues and attention to the risk and profit of R and D activities became important. On the other hand, it's not just the industrial and technological unit that take R and D activities, but other activated industrial units in the society also and other units activated in the community realize the importance of the development. More results were from continuous innovation types.

### **Fourth Generation**

R and D activities of this generation introduces the methods for act in the business and knowledge-based economic environments which is so compatible with the change, new educational opportunities, training, achieve agility and high flexibility, the use of environmental resources and social, management of technology and innovation management, gaining competitive advantage and corporate entrepreneurship.

At this time, the scope of research and development area covers all organizations, and acts in order to stay ahead of the competition in the compression of all knowledge, resources, ideas and works with a focus on knowledge and innovation. Fast learning and ahead of its competitors is important. R and D activities are highly dependent on prediction of market data and information of market and environment. Organizational structure is changing as the innovation,



**Figure 1: Model of research pressure**



**Figure 2: Model of request tendency**

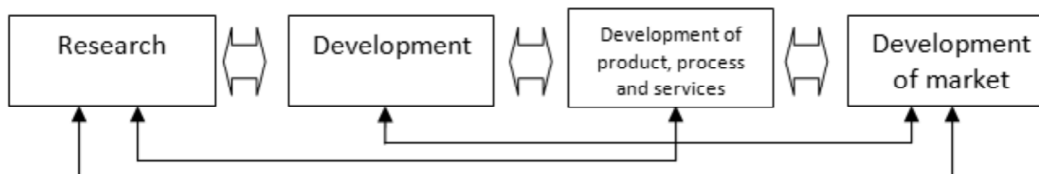
use of the results and identification of opportunities makes it possible to develop the entrepreneur in the simplest form. During change of RandD generations, we observe the society movement from industry to the knowledge as it is obvious in tools, products, techniques and values and in the case of categorization of RandD developments in the traditional and modern forms, we find the models shown below (Brawn, 2015).

Research and developments are defined centers for innovation and its management within the organization also well equipped with processes for identifying opportunities. So, talking about research and development in organization is closed and mingle with innovation processes. The traditional method of innovation and research and development are presented below in general and schematic, as follows:

Classical system (traditional): Pressure of research and tendency of demand are in two forms as follows and finally a new innovation model is visible (Schumpeter).

In the new model of innovation in the entire process, there is a two-way communication between interfaces of this model that reflect the agility and flexibility.

In this model known as Schumpeter, interaction between technological capabilities and market opportunities that add value to search, are stressed.



**Figure 3: Model of research and innovation and novel development (Schumpeter, 1934)**

Schumpeter (1934) for the first time stated that the small entrepreneur businesses are the source of many innovations. He changed his idea later and stated that large corporations with a degree or a degree of monopoly are more likely to be the source of technological innovations. He said that large organizations have complementary assets and other assets necessary for production which is essential for the commercialization of innovation.

On the other hands, because of funding and strong leadership, big companies have a greater willingness for taking risks inherent in innovation, are. On the other hand because of assessments that large companies typically hold, competitors have less tendency to imitate them in the case of innovation and thus the possibility of investing in an innovation project is greater for large organizations. It should be noted that there are challenges in this area means the relationship between firm size and innovation capability (Henttonen *et al.*, 2015).

### **R AND D LEVELS**

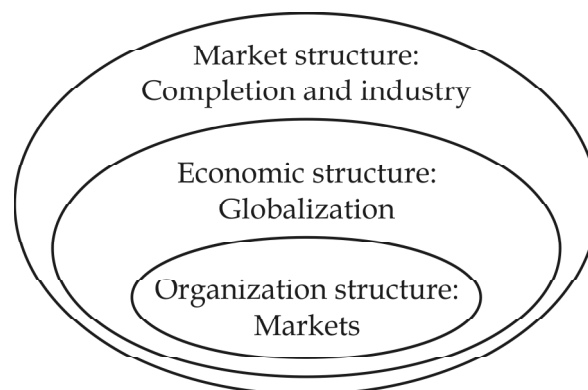
R and D activities in the organizations are affected in three levels as shown below:

#### **Economic Structure**

At this situation, activities are affected by overall economic atmosphere besides the beds where social and industrial investments are laid. For example transition from industrial-based space to knowledge-based space in the macro and economic levels.

#### **Market Structure**

At this situation also known as industrial structure, includes the competition condition of the considered industry, structure of demands and requests, competitors, customers satisfaction levels and market variations. Organizational



**Figure 4: Diagram of R and D levels (William L, Miller and Langdon Morris)**

structure: inter-organizational factors such as centralization, formalization, complexity, inter-organizational communication structure of the organization and overall conditions at this level clearly influences the type of research and development activities in organizations. In one view, it's the structure of the organization which defines the capacity and power of operation and use of research and development activities in an effective form (Zhao, 2005).

### **R and D and Entrepreneurship**

Literature of research and development has far more lifetime than entrepreneurship. R and Ds were developed sometimes for development and growth of the corporate and for a long time they responded to the development literature in the most of industries. But after the market complexity, increase of competitions and problems, the organizations developed the R and D concepts and reached it to the today organizational configuration of entrepreneurship.

Reviewing the literature and studies on the subject makes it clear that the spirit of research and development and corporate entrepreneurship is united. Because the conditions for a good research and development is so closed to that of entrepreneurship in company.

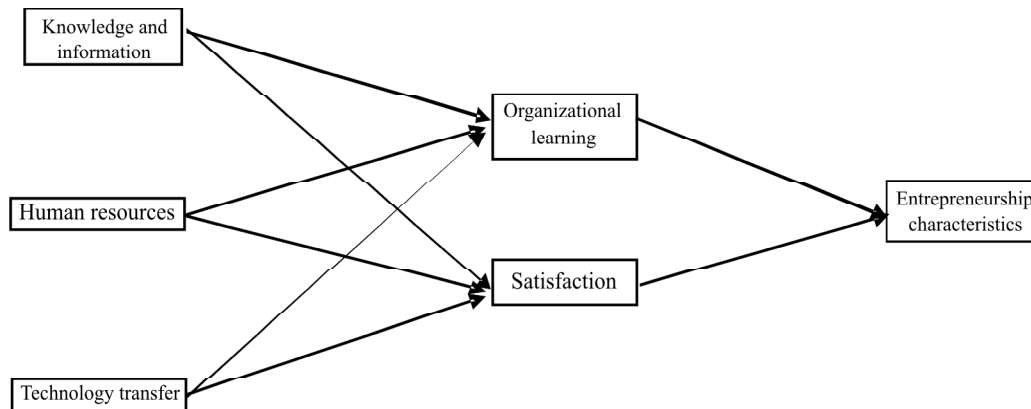
Today, the research and development is performing in companies by higher expertise and the importance in organizations and companies are trying to provide the appropriate space, restructure and strengthen the culture of entrepreneurship and develop strategies in order to development.

According to the literature review, the researchers have actually considered the research and development as one of the most powerful tools for organizations to move regularly, So that the two are considered as a whole and one.

However, according to researchers, regarding the structure of industry and market, this point requires more analysis and review. However, the performance level of research and development in organizations, even affects the performance of other units as a part of the strategies.

And this function must be reported in a reliable way for planning and development. Also the effectiveness of these units on single market and various industries is somewhat different. For example, the performance level of research and development and its relationship with organizational entrepreneurship in the construction industry is very different from the industries examined in this study.

In the view of some researchers, Evaluation of the effect of research and development impact on the corporate entrepreneurship is a type of investigation of a side part of the total. In many cases, depending on the industry and the



**Figure 5: Conceptual model of research variables**

organization type, organizations use the research and development as custodian of innovation, opportunity recognition and even risk assessment (which is the main element of corporate entrepreneurship) use (Rahimi, 2003).

No direct study was found which examined the impact of research and development on entrepreneurship characteristics of the personnel, but many studies have been conducted on how to measure the performance of R and D units, so far from academic and industrial resources.

On the other hand, numerous studies have been conducted by researchers to measure and analyze corporate entrepreneurship that some of them are mentioned below. Based on the review of the theoretical principles and investigation of the past studies, the following model is intended as a conceptual model, including the research and development variables that themselves have elements of knowledge and information, technology transfer and human resources, organizational learning and employee satisfaction as a mediator variable and variable of characteristics of entrepreneurs employees as the dependent variable.

## RESEARCH METHODOLOGY

In general, types of researches are categorized according to two criteria:

- (a) the purpose and nature of research, and
- b) how the data are collected (Sarmad, Bazargan and Hejazi, 2011).

Since it is possible to use the results of this study in order to investigate the role of research and development in characteristics of entrepreneurship in Iran Khodro Company's employees, in the case of purpose and nature of research, it could be counted in applied research category. The aim of applied research is about development of practical knowledge in a particular field. Research method of the



present study is descriptive (non-experimental) and research plan is correlational of path analysis. The study population included all employees of the Iran Khodrocompany in Tehran. According to population size, Cochran formula was used to determine the sample size as 280 persons were considered statistically. For data analysis, descriptive and inferential statistics were used in this study. In the descriptive part, the percentage, mean and standard deviation and in inferential part the Pearson correlation and path analyses will be used. Path analysis that for the first time was developed by Seoul Wright (1934) is a expansion of regression methods, and in fact, the use of multiple regression in relation to the formulation of a clear causal models. Its purpose is to give quantitative estimates of causal relationship between a set of variables (Homan, 2008). SPSS and LISREL software will be used for analysis of research data. In continue, each of these methods have been described.

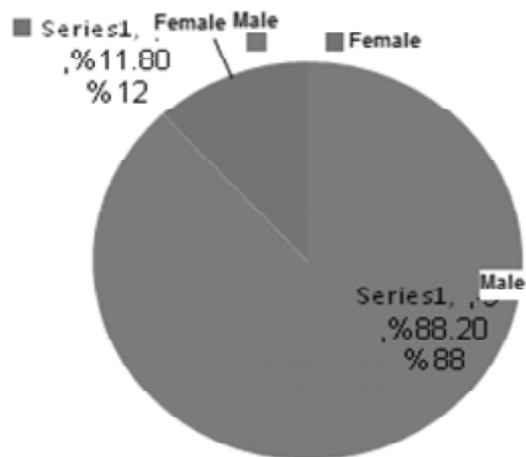
## RESEARCH FINDINGS

### The Descriptive Findings

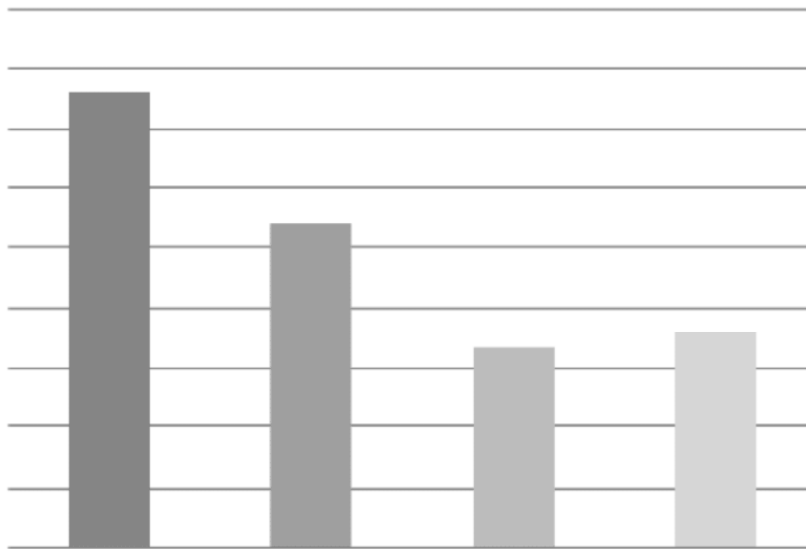
This section describes the study on demographic characteristics of the sample including gender and age.

**Table 1**  
Frequency of the responders based on the gender

<i>% frequency</i>	<i>Frequency</i>	<i>Gender</i>
88.2%	162	male
11.8%	22	Female



**Figure 6: Frequency of the genders**



**Figure 7: Frequency of responders based on the age**

Research findings have shown that about 88% of the responders were composed of females, while 17% were of males.

**Table 2**  
**Frequency of the responders based on the age**

<i>Frequency %</i>	<i>Age</i>
38.19%	29-35 years
27.08%	36-40 years
16.67%	41-45 years
18.06%	> 45 years

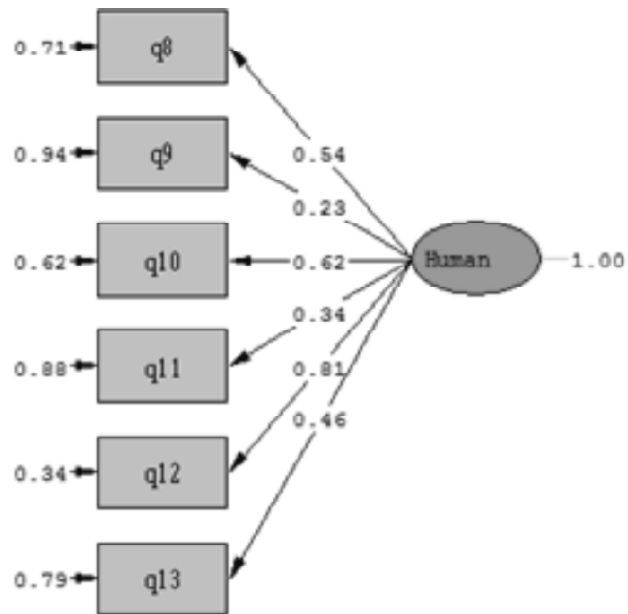
The findings showed that the composition of the population size was as follows: 38% of people aged between 29-35, 27% of 36-40 years, 17% of 41-45 years and 18% over 45 years.

### **Confirmatory Factor Analysis of Data**

First for entering the analysis path, research tools should be undergo confirmatory factor analysis in order to determine the validity of the structure. Confirmatory factor analysis was also used for confirmation of each variable as well as items associated with each of them.

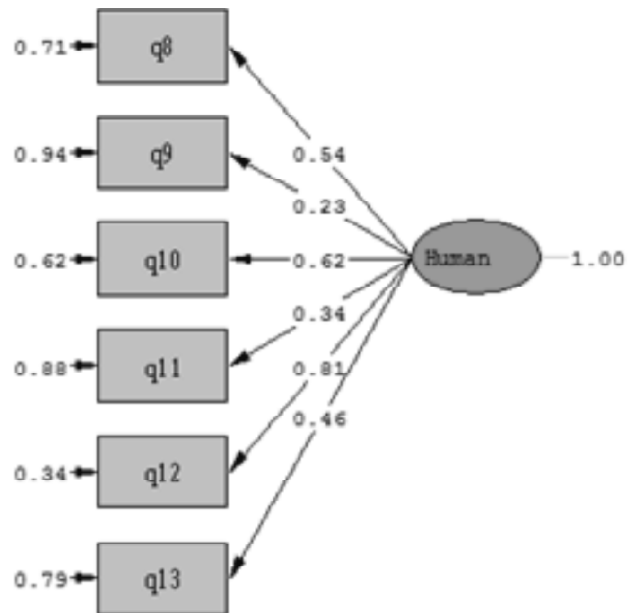
### **Confirmatory Factor Analysis of Variables**

As can be seen in Figure 4-4, the confirmatory factor analysis was used to determine the validity of the knowledge and information.



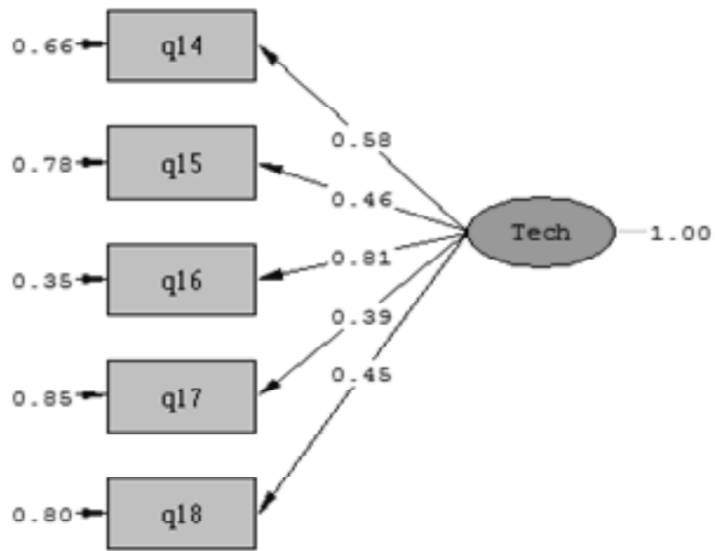
Chi-Square=234.00, df=9, P-value=0.00000, RMSEA=0.000

Figure 8: Output of the confirmatory factor analysis of knowledge and information



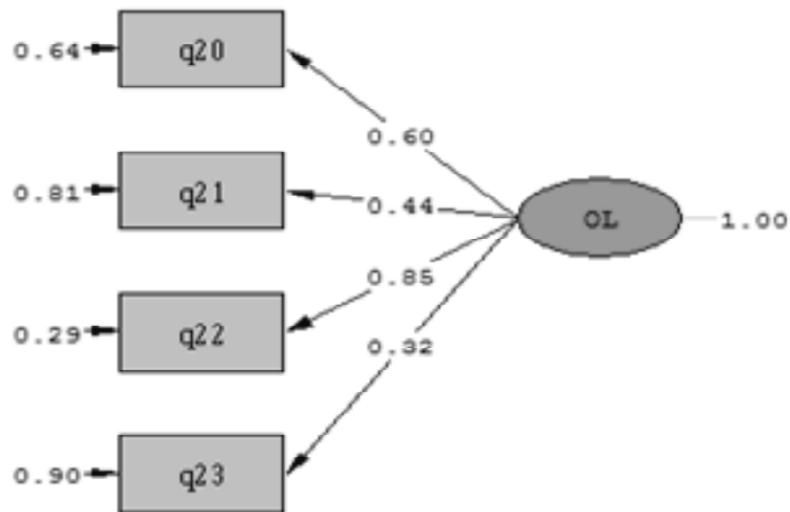
Chi-Square=234.00, df=9, P-value=0.00000, RMSEA=0.000

Figure 9: Output of the confirmatory factor analysis for human resources



Chi-Square=116.76, df=5, P-value=0.00000, RMSEA=0.042

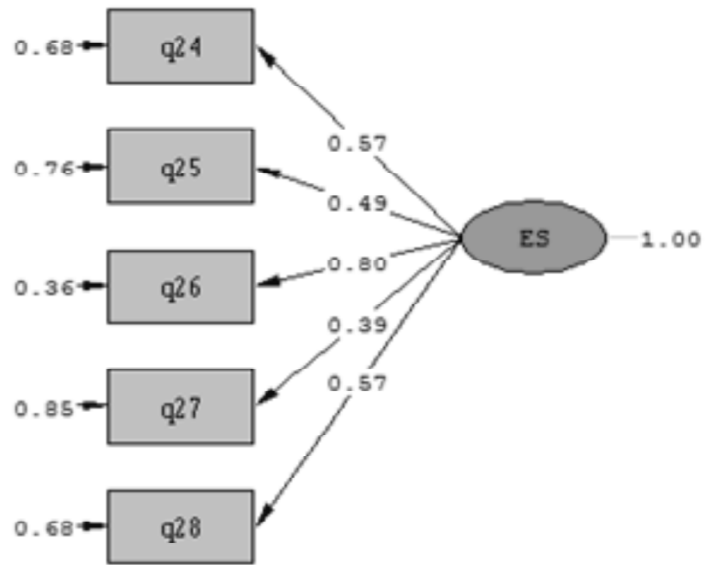
Figure 10: Output of the confirmatory factor analysis for technology transfer



Chi-Square=76.43, df=2, P-value=0.00000, RMSEA=0.012

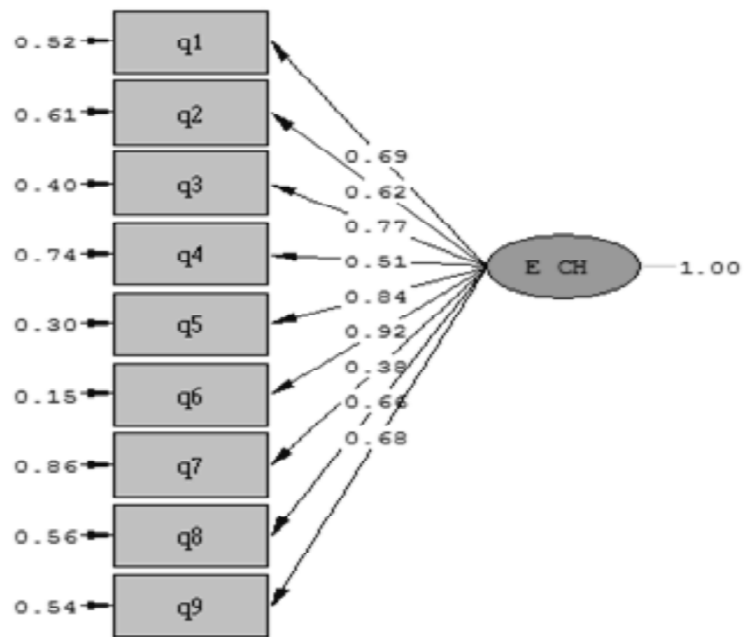
Figure 11: Output of the confirmatory factor analysis for organizational learning

According to confirmatory factor analysis, data of this research are properly fitted with the factor structure of this scale and this indicates the alignment of questions with research variables.



Chi-Square=100.75, df=5, P-value=0.00000, RMSEA=0.024

Figure 12: Output of the confirmatory factor analysis for employees satisfaction



Chi-Square=365.56, df=27, P-value=0.00000, RMSEA=0.035

Figure 13: Output of the confirmatory factor analysis for entrepreneurship characteristics of the employees

### Descriptive Statistics of the Research Variables

Indicators of descriptive statistics for the sample including mean, standard deviation, minimum and maximum score for each variable of this study are presented in Table 3.

**Table 3**  
Descriptive statistics of the research variables

<i>Standard Deviations</i>	<i>Mean</i>	<i>Variables</i>
5.04	8.42	Knowledge and Information
5.33	9.53	Human resources
3.10	6.12	Technology transfer
2.89	5.21	Organizational learning
4.12	10.97	Employee's satisfaction
4.98	12.97	Entrepreneurship characteristics

### The Correlation Coefficient between Variables

After determining the validity of measurement tools to identify the relationship between the variables, the next step is about entering the path of analysis. The Pearson's correlation coefficient was used to identify the relationship between the variables in the model. The findings of correlations coefficient between variables are listed in Table 4.

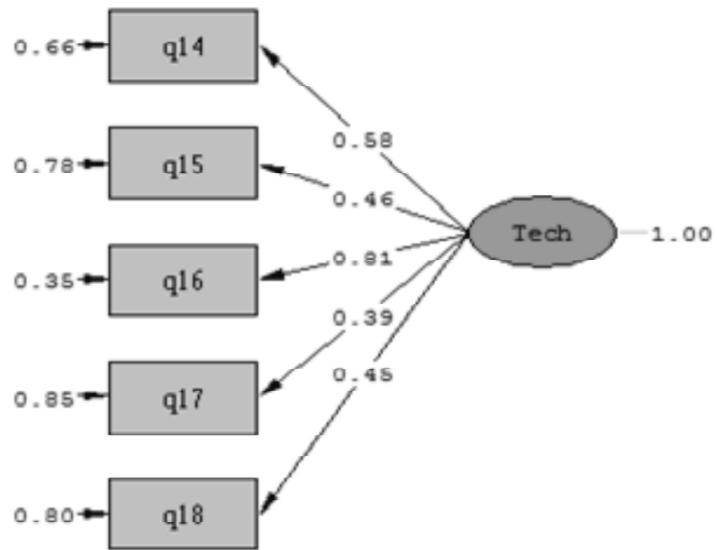
As seen in Table 4, among the research variables, transfer of technology ( $r = 0.69$ ), organizational learning ( $r = 0.54$ ), knowledge and information ( $r = 0.46$ ) have the highest correlation coefficient with characteristics of entrepreneurs, respectively. Only in correlation matrix of the research, relationship between human resources and employees satisfaction was not significant.

**Table 4**  
Correlation matrix of research structures

6	5	4	3	2	1	<i>Variables</i>
	1			1	**0.46	1. Knowledge and technology
			1	**0.36	**0.33	2. human resources
		1	**0.40	**0.24	**0.34	3. Technology transfer
	1	*0.18	**0.37	0.09	**0.23	4. Organizational learning
**0.46	**0.24	**0.69	**0.54	**0.24	1	5. Employees satisfaction
						6. Entrepreneurship characteristics

\* $p < 0.05$  \*\* $p < 0.01$

To evaluate the hypothetical model of this study, first we deal with estimation of the parameters. The coefficients of direct, indirect, total and variance are presented in the Table. Finally, the fitness evaluation indexes of the model and the shape of fitted model have been reported.



Chi-Square=116.76, df=5, P-value=0.00000, RMSEA=0.042

Figure 14: Tested model of the research



Chi-Square=2.23, df=2, P-value=0.32864, RMSEA=0.026

Chi-Square=2.23, df=2, P-value=0.32864, RMSEA=0.026

Figure 15: T-coefficients for the testes model of the research

Figure 14 shows the tested models for the main hypothesis with standardized values on each of the paths. Results show that all paths significant in entrepreneurial characteristics.

$T$  coefficients higher than  $\pm 1.96$  up to  $\pm 2.58$  are significant at the level of 0.05 and  $T$  coefficients higher than  $\pm 2.58$  are significant at the level of 0.01. As shown in Figure 15 except for the path of human resources to employees satisfaction that is not significant, and the path of knowledge and information to employee satisfaction, which is significant at the level of 0.05, all  $T$  coefficients of the paths were higher than 2.58, showing that all paths are significant at the level of 0.01. In addition, the direction of  $T$  coefficient in all paths is positive reflecting the positive and meaningful effect.

The fitting indices obtained for test models presented in Table 5 showed that the RMSEA index in the estimated with the level of 0.066 had an acceptable level and the other fitness index such as CFI, GFI, NFI, NNFI and AGFI were 0.97, 0.96, 0.93, 0.95 and 0.92, respectively and all of them were in the appropriate levels. The goodness characteristics of fitting shows that data of this are properly fitted with the factor structure of this model.

**Table 5**  
**Fitting characteristics of the fitted model**

$x/df$	RMSEA	CFI	GFI	NFI	AGFI
1.11	0.026	1	1	1	0.95

## CONCLUSION

Research and development is from the most important tools and industrial and economic progress positions. In industrialized countries, more than 65 percent of the cost of the research costs is dedicated to this section. Regarding the importance of research and development activities and its vital role in the survival and growth of companies as well as the volume of investments in this sector, assessment of its activities is very important. Since the research and development activities are different in the company, industry and even different markets, first using a native questionnaire, designed according to the study of texts and elites ideas, especially for the desired industry and Iranian Space, performance levels of R and D of the studied organizations was evaluated and measured. At the same time, using another questionnaire (according to Lumpkin and dose model) the level of tendency toward entrepreneurial of the same organizations was evaluated.

By comparing the results, it can be hoped to get useful information about the performance and impact of these tools (research and development which is examined as an independent variable) and entrepreneurial characteristics of the personnel (entrepreneurs of employees who were considered as a dependent variable of the study) and the influence of its major indices on each other. Results indicated that research and development are in a significant and indirect



relationship with three subcomponents of knowledge and information, human resources and technology transition on entrepreneurship characteristics of the employees. The research findings are along with those of Zali (1382), Doziglen and Bildrick (2000), Rutherford and Holt (2004).

One of the results of this study was about the effect of the mediator organizational learning variables and employee satisfaction on the entrepreneurial characteristics of employees. Path analysis of the fitted model showed that the variables of organizational learning and employee satisfaction at the level of (0.01) have a significant effect on entrepreneurial characteristics of Iran Khodro Company employees. These findings are consistent with research results of Purmusa et al (2013), Rashead (2000), Berizk (2003), Zhao (2005), Ünay and Zehir (2012), Doziglen and Bildrick (2000).

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